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# Revisiting the 1991 Water Accord: Climate Change and Interprovincial Water Conflicts in Pakistan

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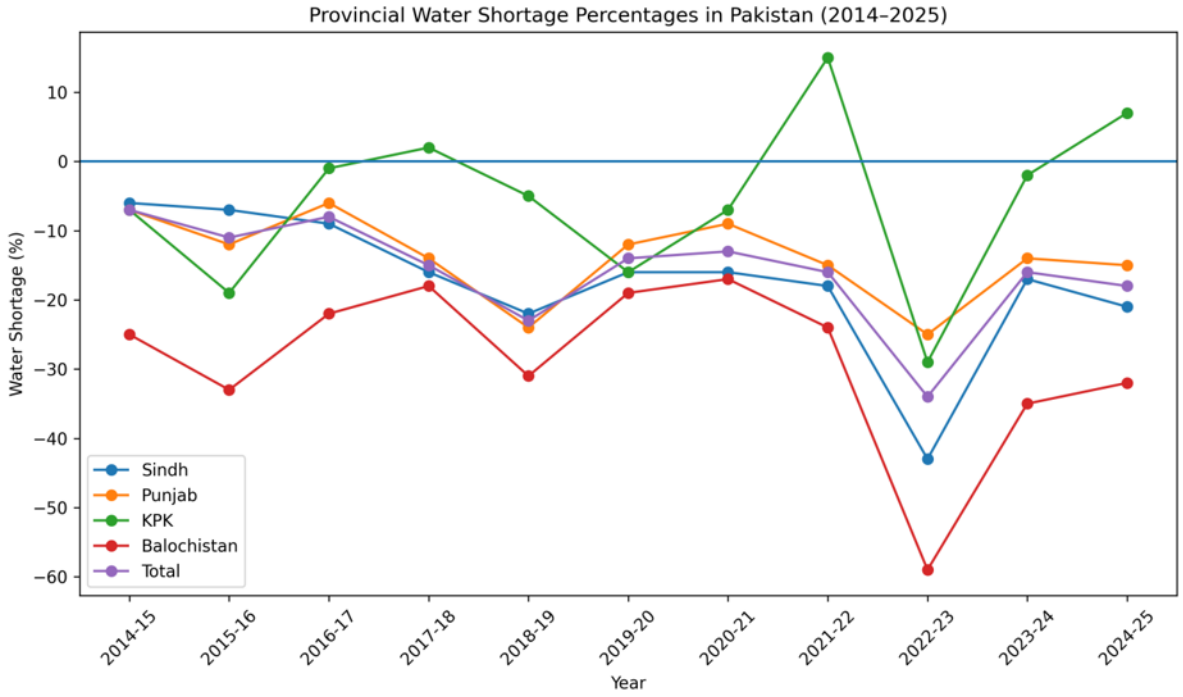
**ABSTRACT**
*This study critically examines how climate change has transformed water scarcity in Pakistan from a manageable resource challenge into a major non-traditional security threat that fundamentally destabilizes interprovincial relations and threatens national cohesion. Drawing on empirical hydrological data, policy analysis of the 1991 Water Apportionment Accord, and assessment of institutional performance within the Indus River System Authority, the research demonstrates that accelerated glacier melts in the Himalayas and Karakoram, erratic monsoon patterns, and prolonged drought episodes have rendered the Accord's fixed provincial allocations increasingly inadequate for managing distribution under conditions of heightened climatic variability. The findings reveal that downstream provinces, particularly Sindh, bear disproportionate socioeconomic consequences including agricultural decline, livelihood destruction, forced migration, and severe ecological degradation in the Indus Delta where seawater intrusion has increased salinity by approximately 70 percent since 1990. Persistent governance weaknesses, including inadequate transparency in water measurement and the absence of adaptive allocation mechanisms, exacerbate provincial mistrust and fuel political narratives that polarize upstream downstream relations. The study concludes that revisiting the Accord through a climate-sensitive lens, strengthening institutional capacity for real-time monitoring, and integrating flexible allocation protocols are essential for ensuring equitable water access, safeguarding agricultural sustainability, and preserving federal harmony in Pakistan's increasingly volatile environmental landscape. Without proactive reforms, water insecurity risks deepening political divisions and jeopardizing long-term national stability.*

***Keywords:*** *water scarcity, 1991 Water Accord, climate change, interprovincial conflicts, Indus River System*

## *Introduction*

Water stands as one of the most vital natural resources for human survival, agricultural productivity, economic development, and national stability. It is the very foundation upon which civilizations have been built and nations have secured prosperity. Pakistan, an agrarian economy, depends profoundly on the Indus River System for irrigation, food security, energy production,

and socioeconomic sustainability. The agricultural sector forms the backbone of the national economy, employing a significant portion of the labor force and contributing substantially to the gross domestic product, while the Indus River and its extensive network of tributaries, canals, and distributaries serve as the lifeline sustaining this entire edifice of productivity. Rapid climate change, explosive population growth, uncontrolled urbanization, and poor water governance have sharply intensified water scarcity across the country, creating a multidimensional crisis threatening decades of development progress. Per capita water availability has declined dramatically from over 5,000 cubic meters in the 1950s to below 1,000 cubic meters today, placing Pakistan in a state of acute water stress (Yu et al., 2013). The 1991 Water Apportionment Accord, signed among Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan after prolonged negotiations, sought to ensure equitable distribution of Indus waters, reduce interprovincial tensions simmering since independence, and establish the Indus River System Authority (IRSA) for oversight. While hailed as a historic breakthrough after decades of bitter disputes, the Accord continues to face persistent controversies, particularly between upstream Punjab and downstream Sindh over allocation and shortage sharing (Anwar, 2017; Hassan, 2019).




Climate change has profoundly complicated these dynamics by accelerating Himalayan and Karakoram glacier melt, altering traditional rainfall patterns, increasing drought and flood frequency, and reducing long-term river flows in ways threatening the fundamental assumptions underlying the existing framework. Although short-term melt may temporarily increase flows, projections indicate declining availability as glaciers retreat and monsoons become erratic, directly challenging the static allocations negotiated under more predictable climatic conditions (Khizar, 2025; Yang et al., 2014). Provinces increasingly accuse one another of unfair diversions, especially during lean periods, fueling political tensions that threaten national cohesion. Recent disputes over new canal projects, acute shortages in lower riparian Sindh devastating farming communities, and environmental degradation in the Indus Delta expose the Accord's limitations amid evolving hydrological realities (Hassan, 2019). IRSA faces persistent criticism for

implementation biases and lack of transparent monitoring, exacerbating mistrust and transforming water into a vector for interprovincial rivalry and non-traditional security threats (Anwar, 2017).

This study critically examines the effectiveness of the 1991 Water Accord under accelerating climate pressures and analyzes how climate-induced scarcity intensifies interprovincial conflicts. The Accord, though a landmark achievement in stabilizing immediate post-independence disputes, struggles against modern realities of demographic surges, hydrological uncertainty, and institutional weaknesses (Anwar, 2017; Yu et al., 2013). Downstream regions, particularly Sindh, bear severe socioeconomic consequences, including agricultural decline, livelihood erosion, rural poverty, migration, and ecological collapse in the delta (Hassan, 2019; Khizar, 2025). These impacts extend beyond economics into deep political grievances undermining national unity. Strengthening IRSA's transparency, integrating climate projections into allocation protocols, and promoting cooperative federalism through data-driven dialogue are essential. Revisiting the Accord is imperative for adaptive, sustainable water governance ensuring equitable access, environmental protection, and resilient development across Pakistan. Without proactive reforms, water insecurity risks deepening divisions and jeopardizing the country's stability in an era of profound environmental transformation (Yang et al., 2014).

**Objectives of the Study**

1. To examine the historical background and constitutional significance of the 1991 Water Accord.
2. To analyze the impacts of climate change on water availability in Pakistan.
3. To investigate the relationship between climate-induced water scarcity and interprovincial conflicts.
4. To evaluate the effectiveness of IRSA and existing water governance mechanisms.
5. To explore the socioeconomic and political impacts of water disputes on different provinces, particularly Sindh.
6. To suggest policy recommendations for sustainable and equitable water governance in Pakistan.

**3. Research Questions**

1. How has climate change affected water availability in Pakistan?
2. To what extent has the 1991 Water Accord succeeded in resolving interprovincial water disputes?
3. How does climate-induced water scarcity intensify interprovincial conflicts in Pakistan?
4. What are the major institutional and governance challenges faced by IRSA in implementing the Accord?
5. What socioeconomic impacts do water conflicts create in downstream provinces such as Sindh?
6. What policy reforms are needed to improve water governance under changing climatic conditions?

**Literature Review**

Studies on climate change and water scarcity in Pakistan underscores the severe vulnerabilities facing the Indus Basin, where accelerated glacier melting in the Himalayas and Karakoram ranges disrupts traditional hydrological cycles (Yu et al., 2013). Studies highlight how rising temperatures have intensified glacial retreat, initially boosting short term flows but projecting

long term declines in river discharge as ice reserves diminish (Mehboob et al., 2021). This phenomenon compounds with shifting precipitation patterns that manifest in more frequent and intense droughts alongside devastating floods, eroding the reliability of water supplies critical for agriculture and domestic needs. Per capita water availability has plummeted dramatically from over 5,000 cubic meters annually in the 1950s to below 1,000 cubic meters today, categorizing Pakistan as a water scarce nation with projections indicating absolute scarcity under 500 cubic meters by 2025 (Ishaque, 2022; Baocheng, 2024). Such trends not only threaten food security in this agrarian economy but also amplify competition over dwindling resources, setting the stage for governance failures in a basin that supports over 200 million people.

The 1991 Water Apportionment Accord stands as a pivotal historical achievement in Pakistani federalism, emerging from decades of ad hoc allocations and interprovincial wrangling following independence. Crafted through consensus among Punjab, Sindh, Khyber Pakhtunkhwa, and Balochistan, the Accord established fixed provincial shares from the Indus River System while embedding constitutional dimensions of equitable resource distribution and cooperative governance (Anwar, 2017; Government of Pakistan, 1991). Its political significance lies in institutionalizing mechanisms to curb upstream downstream rivalries and foster national unity in water management. Central to its implementation is the Indus River System Authority (IRSA), created to monitor distribution, resolve disputes, and enforce allocations on a ten daily basis using tools like the three-tier formula (Hassan, 2019). Despite these strengths, literature reveals persistent critiques regarding the Accord's rigidity in the face of variability, with IRSA often criticized for limited transparency and enforcement capacity amid evolving demands (Anwar, 2018).

Interprovincial water conflicts, particularly the enduring Punjab Sindh disputes, dominate scholarly discourse as manifestations of lower riparian concerns and contested development narratives. Punjab, as the upper riparian with greater canal infrastructure, faces accusations from Sindh of disproportionate diversions, especially during scarcity periods, fueling narratives of historical injustice and ecological harm in the Indus Delta (Ranjan, 2015; Mustafa et al., 2017). Canal controversies, such as recent proposals for new projects in Cholistan and link canals, exacerbate tensions by highlighting perceived violations of the 1991 Accord and intensifying political mobilization along provincial lines (The Friday Times, 2025). These conflicts extend beyond hydrology into identity politics, where Sindh emphasizes environmental degradation and livelihood losses while Punjab prioritizes agricultural expansion and food production goals. Such dynamics illustrate how water allocation becomes intertwined with power asymmetries, undermining trust and cooperative federalism essential for basin wide sustainability.

Water security in Pakistan increasingly intersects with national security frameworks through environmental security theory, positioning scarcity as a potent nontraditional threat capable of triggering social instability (Akhtar, 2023). Scholars apply this lens to demonstrate how climate amplified resource stress erodes human security, exacerbates migration, heightens food insecurity, and risks communal violence in vulnerable regions (Ishaque, 2022). The interplay of declining availability, population pressures, and governance gaps transforms water into a multiplier of broader instability, challenging state legitimacy and interprovincial harmony. Political ecology perspectives further reveal how unequal power relations in resource distribution perpetuate vulnerabilities, particularly for downstream communities, urging integrated approaches that blend adaptation strategies with institutional reforms (Biemans et

al., 2019). Addressing these threats demands proactive policies that transcend sectoral silos to safeguard socioeconomic stability and national cohesion amid accelerating environmental change.

**Research Gap**

Despite a growing body of scholarship on climate change, water scarcity, and the 1991 Water Accord, significant gaps persist in the literature that this study seeks to address. Numerous researchers have examined these elements in isolation, with some emphasizing hydropolitics and institutional water governance frameworks while others explore environmental security dimensions and Pakistan's broader climate vulnerability. However, few investigations successfully integrate climate change dynamics, the operational realities of the 1991 Water Accord, and escalating interprovincial conflicts within a unified sociopolitical and national security lens. Existing studies predominantly adopt technical perspectives on water management, such as hydrological modeling and allocation mechanics, while devoting insufficient attention to the profound social inequities, political tensions, and security implications of these disputes. Moreover, limited research critically assesses the Accord's ongoing viability amid contemporary climatic transformations, including rapid Himalayan and Karakoram glacier retreat, increasingly erratic monsoons, frequent droughts, and sustained declines in river flows that challenge its foundational assumptions. This study bridges these voids by forging explicit connections between climate induced scarcity and interprovincial rivalries, particularly the Punjab Sindh divide, while rigorously reassessing the Accord through the interconnected prisms of environmental security theory, governance efficacy, and socioeconomic vulnerability. By doing so, it offers a holistic framework that transcends fragmented analyses to inform adaptive policies essential for Pakistan's water security and national cohesion in an era of unprecedented environmental stress.

**Research Methodology**

**Research Design**

This study adopts a qualitative research design underpinned by descriptive and analytical approaches to provide a nuanced understanding of the 1991 Water Accord amid climate change. The research is exploratory in nature as it delves into emerging interprovincial dynamics, analytical in dissecting causal relationships between scarcity and conflict, and case study based by centering on the Indus River System as a critical exemplar of water governance challenges in Pakistan. This multifaceted design enables a comprehensive examination of historical agreements, contemporary climatic pressures, and sociopolitical tensions, facilitating deep insights into how environmental transformations reshape federal water relations. By prioritizing contextual richness over statistical generalization, the approach aligns with the complex, contested realities of water politics in an agrarian federal state facing existential resource stress.

**Data Collection Methods**

Data collection integrates primary and secondary sources to ensure robust triangulation and validity. Primary data will be gathered through semi structured interviews with key stakeholders, including water experts, IRSA officials, policymakers, farmers, and environmental activists, allowing for firsthand perspectives on implementation gaps and lived experiences of scarcity. Secondary data will draw from diverse repositories such as government reports, IRSA operational documents, and climate assessments from the IPCC, PCRWR, and WAPDA, scholarly research articles, newspaper archives, and official policy papers. This combination captures both

institutional narratives and grassroots realities, providing a balanced foundation to evaluate the Accord's effectiveness against evolving hydrological and political landscapes.

**Sampling and Data Analysis**

Purposive sampling will be employed to deliberately select respondents with direct relevance to water governance and climate policy, ensuring depth and expertise in the collected insights. Thematic analysis will serve as the core data analysis method, systematically identifying and interpreting recurring patterns related to water scarcity, governance failures, institutional weaknesses, and provincial conflicts. Through iterative coding and theme refinement, this technique will uncover underlying connections between climate impacts and interprovincial tensions, transforming raw qualitative data into coherent findings that support evidence-based recommendations for adaptive water management in Pakistan.

**Theoretical Framework**

This study anchors its theoretical foundation in Environmental Security Theory, which posits that environmental degradation and resource scarcity constitute profound threats to human security, political stability, and broader national security (Homer Dixon, 1994). Pioneered by scholars such as Homer Dixon, the theory illuminates how scarcities in renewable resources like freshwater do not inevitably spark violence but act as threat multipliers that exacerbate existing social cleavages, undermine state capacity, and intensify grievances across ethnic, provincial, and class lines (Gizewski & Homer Dixon, 1996). In the Pakistani context, climate induced alterations to the Indus Basin including glacial retreat, erratic monsoons, and declining flows transform water scarcity into a nontraditional security challenge that strains interprovincial relations and tests federal cohesion (Mustafa, 2013). The 1991 Water Accord, while a stabilizing mechanism, faces erosion as environmental pressures amplify competition between upstream and downstream provinces, potentially escalating disputes into wider instability that affects food security, livelihoods, and social harmony (Farooq & Farmanullah, 2023). This framework enables a rigorous analysis of how climate vulnerabilities in Pakistan transcend mere resource deficits to imperil national resilience.

Complementing this perspective, the Political Ecology Approach examines the intricate ways in which power relations, politics, and unequal resource distribution shape environmental conflicts and perpetuate socioeconomic inequalities. This lens reveals water disputes as inherently political arenas where dominant actors and institutional arrangements favor certain provinces and interests over others, often marginalizing lower riparian communities and downstream ecosystems (Mustafa, 2010; Akhter, 2015). Applied to the Indus system, it critiques how historical power asymmetries embedded in the 1991 Accord and IRSA operations reflect and reinforce provincial hierarchies, with Punjab's upstream advantages clashing against Sindh's ecological grievances and demands for equity (Mustafa et al., 2017). Such dynamics highlight how governance failures and political narratives around canal projects and water allocations are not neutral technical matters but outcomes of contested power structures that deepen vulnerabilities under climate stress (Sattar, 2023). By integrating political ecology, the study uncovers the sociopolitical roots of water conflicts, moving beyond simplistic scarcity narratives to interrogate how elite decisions and institutional biases exacerbate inequalities and hinder cooperative federalism.

Together, Environmental Security Theory and the Political Ecology Approach provide a robust, interdisciplinary scaffold for reassessing the 1991 Water Accord under climate change. While the

former underscores the security implications of resource stress as a catalyst for instability, the latter dissects the power laden processes that mediate these threats, offering a comprehensive view of how environmental change interacts with governance and politics in Pakistan (Homer Dixon, 1994; Mustafa, 2013). This dual framework facilitates an analytically sharp evaluation of interprovincial tensions, institutional shortcomings in IRSA, and socioeconomic fallout in vulnerable provinces, ultimately guiding policy recommendations that prioritize adaptive, equitable, and inclusive water governance. In an era of accelerating climatic uncertainty, these theories advocate for transformative approaches that address both the biophysical realities of scarcity and the structural inequities fueling conflict, fostering pathways toward sustainable national cohesion and resilience in the Indus Basin.

**Results and Findings**

The findings of this study confirm that climate change has markedly reduced water availability in Pakistan, primarily through irregular rainfall patterns, accelerated glacier melting in the Himalayas and Karakoram ranges, and prolonged drought episodes that strain the entire Indus River System beyond its historical operating parameters. Empirical data reveal significant shifts in hydrological regimes, with short term increases in meltwater giving way to long term declines in river flows projected to reach up to 20 percent by 2050, a reduction that would fundamentally alter the water balance upon which national agricultural planning depends (Baocheng, 2024). These changes intensify competition among provinces for dwindling resources, as erratic monsoons and extreme weather events disrupt predictable allocation schedules established decades ago under assumptions of climatic stability that no longer hold true. The Indus Basin, which supports agriculture for over 200 million people through an intricate network of barrages and canals, now faces heightened vulnerability where seasonal variability amplifies scarcity during critical cropping periods such as the wheat sowing and rice transplantation windows, thereby elevating interprovincial tensions and challenging food security across the federation in ways that extend far beyond mere statistical indicators of water stress (Khizar, 2025). Ground level observations from farming communities across Punjab and Sindh corroborate these trends, with cultivators reporting increasingly unreliable water deliveries that force difficult choices between abandoning certain crops and investing in expensive groundwater pumping that further depletes already stressed aquifers.

Analysis of the 1991 Water Accord demonstrates that while historically significant in fostering initial consensus among the federating units after decades of acrimonious dispute, the agreement encounters severe implementation challenges under current climatic conditions that its framers could not have anticipated when the distribution formula was negotiated. Institutional weaknesses within the Indus River System Authority, including inadequate transparency in water measurement and real time flow monitoring, combine with deep mistrust among provinces and overriding political interests to perpetuate recurring disputes that the Accord was specifically designed to resolve (Anwar, 2017). The fixed provincial shares, negotiated under more stable climatic assumptions that reflected the hydrological understanding of the late twentieth century, prove inflexible amid growing variability in river flows, leading to frequent accusations of inequitable diversions particularly during shortage periods when the gap between demand and supply becomes most acute and politically charged. These governance shortfalls not only undermine the Accord's original intent but also erode public confidence in federal mechanisms designed to ensure equitable distribution, creating a

legitimacy deficit that provincial political actors readily exploit to mobilize regional constituencies (Mustafa, 2013). The absence of independent auditing of IRSA decisions compounds this problem, as provinces suspect that reported compliance figures conceal systematic violations that benefit politically influential upstream interests at the expense of weaker downstream claimants who lack comparable leverage in national power structures.

Downstream regions, especially Sindh, bear disproportionate socioeconomic consequences from these dynamics, manifesting in widespread agricultural decline across formerly productive districts, loss of livelihoods that had sustained rural communities for generations, rising rural poverty that traps households in cycles of deprivation, large scale migration toward already overcrowded urban centers, and severe ecological degradation along the Indus Delta coastline. Reduced freshwater flows have accelerated seawater intrusion in the Indus Delta, increasing salinity levels by approximately 70 percent since 1990 and devastating farming and fishing communities whose economic survival depends directly on the delicate balance between river discharge and tidal influence (Mahla, 2026). This environmental transformation has triggered substantial crop losses, forced population displacements from delta villages that have existed for centuries, and contributed to ecosystem collapse that threatens biodiversity and long-term productivity of natural resources that underpin regional economic activity. Such localized impacts ripple outward through provincial economies and political systems, exacerbating provincial grievances against federal water management institutions and highlighting how environmental pressures translate into tangible human and economic costs concentrated in lower riparian areas that lack alternative water sources (Baocheng, 2024). The cumulative effect of these downstream burdens has been the emergence of a powerful narrative of regional victimization that increasingly dominates Sindh's political discourse and shapes its negotiating positions within interprovincial water forums.

**Discussion**

The results underscore that climate change has transformed water scarcity from a manageable resource issue into a potent driver of interprovincial competition within the Indus River System, fundamentally altering the political economy of water distribution in Pakistan. Irregular rainfall, glacier retreat across the Upper Indus Basin, and extended drought periods collectively reduce reliable flows, placing unprecedented pressure on the 1991 Water Accord's allocation framework that was designed for a hydrological regime substantially different from contemporary realities (Khizar, 2025). This environmental shift acts as a threat multiplier, where natural variability intersects with high population growth and outdated irrigation infrastructure to heighten tensions between upstream and downstream provinces that increasingly view each other's water claims as incompatible with their own developmental aspirations. The findings align with broader regional patterns where climatic uncertainty disrupts traditional water sharing arrangements, compelling provinces to prioritize their immediate needs over cooperative federalism and thereby risking national cohesion at a moment when unified responses to environmental challenges are most urgently required (Mahla, 2026). Comparative evidence from other transboundary river basins in South Asia and beyond confirms that water scarcity under climate change tends to exacerbate preexisting political cleavages, suggesting that Pakistan's interprovincial water tensions reflect structural dynamics rather than transient disagreements amenable to simple technical fixes.

The 1991 Water Accord, though a landmark achievement in Pakistani federalism that demonstrated the possibility of negotiated consensus on highly contentious resource questions, reveals critical limitations in addressing contemporary realities marked by institutional weaknesses, provincial mistrust, and pervasive political influences over ostensibly technical decisions. Lack of transparent measurement systems and adaptive mechanisms within the Indus River System Authority allows disputes to fester over extended periods, particularly over shortage sharing formulas and new canal developments that downstream provinces view as existential threats to their water entitlements (Anwar, 2017). These challenges reflect deeper governance gaps that prevent the Accord from evolving alongside hydrological changes, resulting in persistent accusations of bad faith and eroded trust that makes future compromise increasingly difficult to achieve through existing institutional channels. Without comprehensive reforms to enhance data transparency, strengthen dispute resolution procedures, and introduce flexibility into allocation protocols, the agreement risks becoming increasingly obsolete amid accelerating climate impacts that demand nimble and responsive governance rather than rigid adherence to historical formulas (Mustafa, 2013). The political economy of reform remains challenging, as any modification to the Accord's distribution percentages would require consensus among provinces whose interests diverge sharply, creating a collective action problem that perpetuates the status quo even as its inadequacy becomes manifestly apparent to all stakeholders.

Socioeconomic repercussions in downstream Sindh illustrate the human dimension of water conflicts, with agricultural decline, livelihood losses, rural poverty, forced migration, and ecological degradation creating interconnected cycles of vulnerability that trap affected populations in conditions of deepening deprivation. Seawater intrusion and reduced freshwater flows have rendered vast delta areas unproductive for traditional agriculture, forcing communities to abandon occupations passed down through generations and migrate to urban centers already strained by limited housing, employment opportunities, and municipal services (Baocheng, 2024). These effects extend beyond narrow economic metrics to encompass social instability, as affected populations experience heightened food insecurity, loss of cultural heritage intimately tied to the river, and psychological distress arising from the rupture of community bonds that depended on shared agricultural rhythms. The concentration of impacts in lower riparian zones amplifies perceptions of systemic inequity, fueling political narratives that further polarize provincial relations and complicate efforts to build consensus around reform measures (Mahla, 2026). When communities in Thatta and Badin districts see their lands turning saline while upstream canals carry water to irrigate new agricultural developments, the resulting sense of grievance acquires a moral intensity that technical arguments about overall basin efficiency cannot easily counter or dismiss.

Ultimately, water insecurity in Pakistan emerges as a multidimensional national security challenge that transcends narrow environmental concerns to affect political stability, social cohesion, and economic sustainability across all provinces and sectors of national life. The interplay of climate induced scarcity, governance failures within federal water institutions, and intensifying provincial disputes threatens the foundations of federal harmony and long-term development prospects that depend on predictable access to water resources (Mustafa, 2013). By framing these interconnected issues through environmental security and political ecology lenses, the study highlights the urgent need for adaptive policies that integrate forward looking

climate projections, strengthen institutional capacity for transparent and accountable management, and promote trust building through sustained dialogue among all stakeholders with legitimate interests in the Indus system. Proactive reforms, including modernized allocation protocols that can flex in response to changing hydrological conditions and inclusive stakeholder engagement that gives voice to affected communities currently marginalized from decision making processes, are essential to mitigate risks and harness water as a unifying rather than divisive force in Pakistan's uncertain environmental future (Khizar, 2025). The alternative, a continuation of current trajectories marked by institutional paralysis and escalating interprovincial recrimination, carries consequences too severe for any responsible policymaker to contemplate with equanimity.

**Conclusion**

This study concludes that climate change has fundamentally transformed water scarcity from a localized resource challenge into a major nontraditional security threat in Pakistan, reshaping the very parameters within which national water policy must operate and demanding analytical frameworks that extend far beyond conventional hydrological assessment. The 1991 Water Accord, despite serving as a landmark agreement that brought hard won interprovincial consensus on Indus River water distribution after decades of acrimonious dispute and political deadlock, now confronts mounting pressures from shifting climatic patterns, rapid population growth that has pushed national numbers beyond all projections, and persistent institutional weaknesses that prevent adaptive responses to emerging challenges. Accelerated glacier melts across the Himalayan and Karakoram ranges, increasingly erratic rainfall patterns that defy traditional seasonal expectations, and prolonged drought episodes affecting multiple provinces simultaneously have rendered the Accord's fixed allocations increasingly inadequate for managing real world distribution under conditions of heightened variability and reduced overall availability. These converging pressures intensify competition among federating units and expose the fragility of existing frameworks in the face of hydrological uncertainty that the Accord's original architects could scarcely have anticipated when they negotiated percentage shares under the relatively stable climatic regime of the late twentieth century. As a result, what was once a tool for stability and a symbol of successful interprovincial negotiation has become strained to its operational limits, highlighting the urgent need to adapt historical arrangements to contemporary realities where environmental degradation directly undermines national resilience and federal harmony through mechanisms that operate across multiple scales simultaneously?

Persistent disputes among provinces, particularly the recurring confrontations between upstream Punjab and downstream Sindh over shortage sharing formulas, canal construction projects, and the timing of reservoir releases during critical agricultural periods, reveal that current water governance mechanisms demand comprehensive reforms to remain effective in an era defined by accelerating environmental change. Without embracing adaptive policies that incorporate climate projections into allocation protocols and without cultivating genuine cooperative federalism grounded in mutual recognition of shared vulnerability, climate induced scarcity risks deepening political tensions that already strain the fabric of national unity, exacerbating socioeconomic inequalities between water rich and water poor regions, and threatening long term stability across Pakistan in ways that conventional security frameworks fail to capture adequately. The findings emphasize that downstream provinces like Sindh

continue to suffer disproportionate impacts including agricultural decline, livelihood destruction, forced migration, and ecological collapse in the Indus Delta, while upstream downstream divides erode the trust and collective action necessary for confronting challenges that transcend provincial boundaries and demand unified national responses. Revisiting the 1991 Water Accord through a climate sensitive lens that integrates scientific projections, transparent monitoring systems, and flexible allocation mechanisms is therefore essential not only for securing equitable water access for all provinces regardless of their geographical position along the river system but also for safeguarding national cohesion, agricultural sustainability, and socioeconomic development in an increasingly volatile environmental landscape that will test the resilience of Pakistan's institutions and the wisdom of its leadership for decades to come. The stakes could hardly be higher, as the choice between proactive reform and continued institutional paralysis will determine whether water serves as a foundation for shared prosperity or becomes an accelerant of division in a country where past, present, and future remain inextricably bound to the fate of the Indus River.

**Recommendations**

- Develop climate sensitive water governance frameworks that incorporate real time hydrological data, seasonal forecasting, and flexible allocation protocols to address variability in river flows.
- Strengthen the institutional capacity of the Indus River System Authority (IRSA) through enhanced technical resources, independent monitoring systems, and greater autonomy in dispute resolution.
- Implement transparent water distribution mechanisms using modern telemetry, satellite monitoring, and publicly accessible data platforms to build confidence among provinces.
- Formulate sustainable water management policies that prioritize efficient irrigation techniques, groundwater regulation, and ecosystem-based approaches to conserve resources.
- Promote provincial cooperation and trust building initiatives through regular interprovincial dialogues, joint fact-finding missions, and confidence building measures.
- Integrate environmental security considerations into national policy by treating water scarcity as a multidimensional threat in defense and development planning.

- Invest in large scale infrastructure modernization, including climate resilient storage facilities and efficient canal systems, while ensuring equitable benefit sharing.
- Launch targeted socioeconomic support programs for vulnerable downstream communities in Sindh, focusing on livelihood diversification, delta restoration, and migration management.
- Revise the 1991 Water Accord through a participatory process involving all stakeholders to embed adaptive clauses for climate emergencies and shortage sharing.
- Foster regional collaboration with neighboring countries on transboundary Indus Basin management to enhance overall water security amid shared climate challenges.

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